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Drill rig

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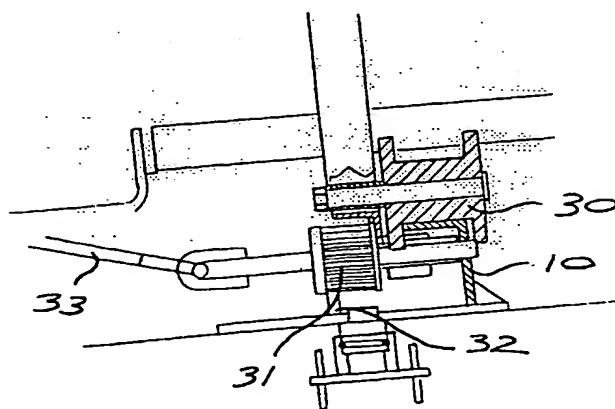
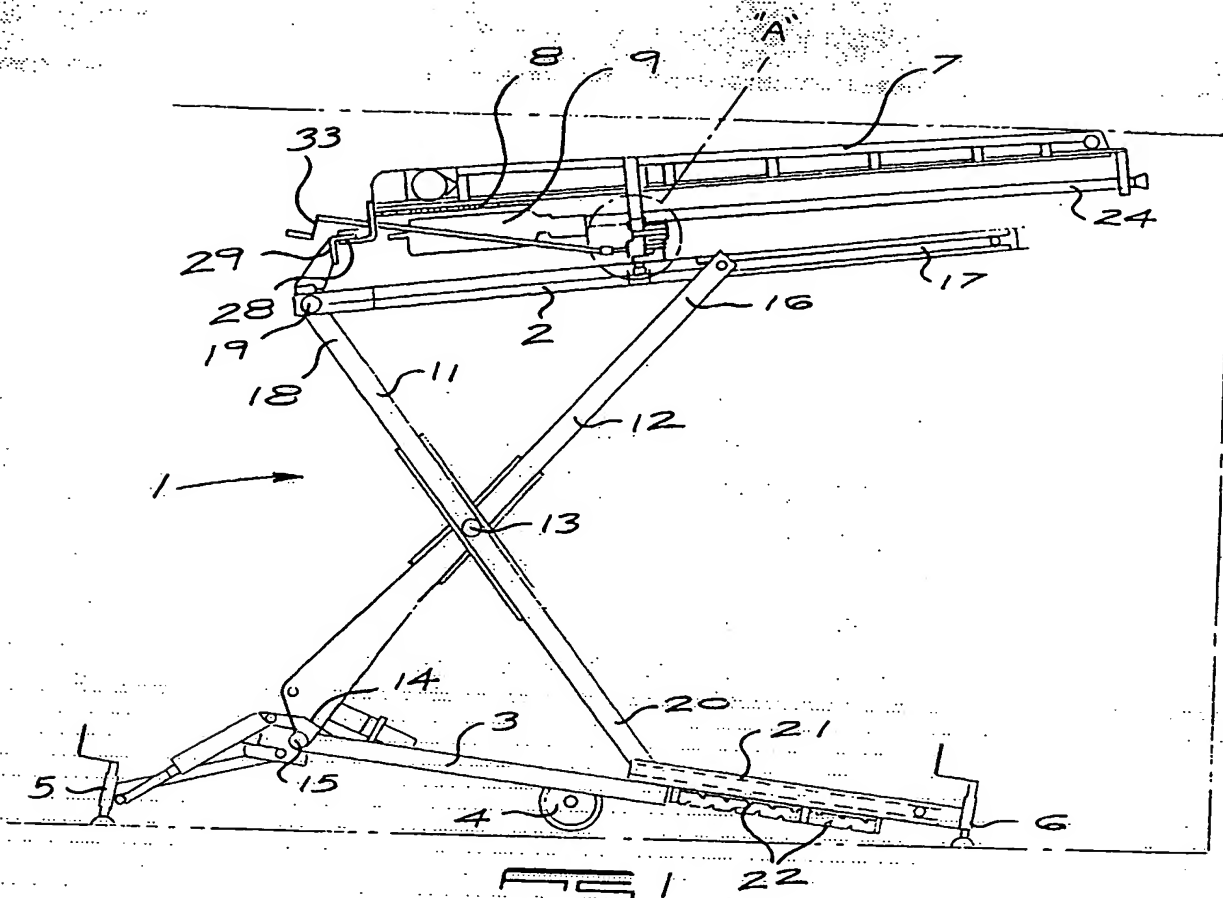
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ABSTRACT

A drill rig is provided in which a drill boom is supported on the upper of two frames whilst the lower of the two frames supports the rig. The two frames are interconnected by pivoted elongate support members in such a way that the inclination of the upper frame relative to the lower frame varies as the upper frame is raised and lowered. The variation in inclination is such that holes to be drilled automatically assume the required inclination relative to the grade of the development.

THE CLAIMS DEFINING THE INVENTION ARE AS FOLLOWS:

1. A drill rig comprising an upper and a lower frame assembly wherein the lower frame assembly is adapted to support the drill rig during use as well as during transport and the upper frame assembly supports a drill boom and associated drill and carriage assembly, the drill rig being characterised in that the lower frame assembly and upper frame assembly are interconnected by elongate supports pivotally interconnected intermediate their ends to divide each support into a foremost limb and a rear-most limb wherein at least the operatively upper and rear-most support limb is shorter than the operatively upper and foremost support limb, the arrangement being adapted to automatically adjust the inclination of the drill boom to the grade as the upper frame assembly is raised and lowered relative to the lower frame assembly.
2. A drill rig as claimed in claim 1 in which the forward ends of each of the elongate supports are movable along part of the length of the upper and lower frames respectively.
3. A drill rig as claimed in claim 2 in which the lower frame has a series of stop positions co-operating with the associated end of the co-operant support, the stop positions corresponding to desired heights of holes to be drilled by the drill rig.
4. A drill rig as claimed in claim 1 in which a single hydraulic piston and cylinder assembly is coupled between the lower frame assembly and the lower end region of the lower rear-most limb of the supports.
5. A drill rig as claimed in claim 1 in which the lower frame assembly has a simple pair of supporting rail wheels positioned intermediate its ends.
6. A drill rig as claimed in claim 1 in which the forward and rearward ends of the lower frame assembly have adjustable jacks for supporting the lower frame on a foot wall in adjustable manner.



AUSTRALIA
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COMPLETE SPECIFICATION
STANDARD PATENT

Applicants:

- 1) HYDRO POWER ENGINEERING (PROPRIETARY) LIMITED
- 2) NORTHAM PLATINUM LIMITED

Invention Title:

DRILL RIG

The following statement is a full description of this invention, including the best method of performing it known to me/us:

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DRILL RIG**FIELD OF THE INVENTION**

This invention relates to a drill rig and, more particularly, a drill rig which is particularly, although not exclusively, suitable for use in drilling blast holes in the development end of a tunnel in an underground mining operation.

BACKGROUND TO THE INVENTION

In the drilling of such blast holes it is important that the axes of the holes extend in the correct direction and that the holes are drilled in a predetermined pattern. The holes near the side edges of the tunnel and at the roof and hanging walls need to be drilled at an incline to the general grade or axial direction of the tunnel itself in order to ensure that sufficient rock is broken out to maintain the required cross-sectional dimensions of the tunnel.

It is accordingly necessary to align a drill correctly both with regard to inclination relative to the grade in the vertical direction as well as in the horizontal direction in order that the tunnel follow the required direction.

OBJECT OF THE INVENTION

It is the object of this invention to provide a drill rig which greatly facilitates the drilling of a series of blast holes in their correct relative positions, as well as their correct inclinations both in the horizontal and vertical direction.

SUMMARY OF THE INVENTION

5 In accordance with this invention there is provided a drill rig comprising an upper and a lower frame assembly wherein the lower frame assembly is adapted to support the drill rig during use as well as during transport and the upper frame assembly supports a drill boom and associated drill and carriage assembly, the drill rig being characterised in that the lower frame assembly and upper frame assembly are interconnected by elongate supports pivotally interconnected intermediate their ends to divide each support into a foremost limb and a rear-most limb wherein at least the operatively upper and rear-most support limb is shorter than the operatively upper and foremost support limb, the arrangement being adapted to automatically adjust the inclination of the drill boom to the grade as the upper frame assembly is raised and lowered relative to the lower frame assembly.

10 Further features of the invention provide for the forward ends of the elongate supports to be movable along part of the length of the upper and lower frames respectively; for the lower frame to have a series of stop positions co-operating with the associated end of the co-operant support, the stop positions corresponding to desired heights of holes to be drilled by the drill rig; and for a single hydraulic piston and cylinder assembly to be coupled between the lower frame assembly and the lower end region of the lower rear-most limb of the supports.

15 Still further features of the invention provide for the lower frame assembly to have a single pair of supporting rail wheels intermediate its ends; for both the forward and rearward ends of the lower frame assembly to have adjustable jacks for supporting the lower frame on a foot wall in adjustable manner; and for at least the upper, and optionally also the lower frame assembly to have laterally extendible outrigger arms for locking against the side walls during drilling operations.

20 Preferably, the upper frame assembly of this invention includes a transversely extending track made to a required profile and substantially supporting the drill boom assembly with a rearward guide co-operating with a guide formation on the rear end of the drill boom assembly whereby the drill boom assembly can be moved laterally with a drill parallel to the grade in the central region and at or towards the extremities with the drill being inclined somewhat outwardly from the

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grade in plan view, in which case the track preferably includes a rack co-operating with a pinion associated with the drill boom so that rotation, say by means of a crank, of the pinion can be employed to move the drill boom laterally along the length of the track from one side of the upper frame to the other.

5 In order that the above and other features of the invention may be more fully understood one embodiment thereof will now be described with reference to the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

In the drawings:-

FIG. 1 is a side elevation showing a drill rig according to the invention in a vertically extended position;

FIG. 2 is an enlarged view of the area indicated by circle "A" in Figure 1; and,

FIG. 3 is a plan view of the rig.

DETAILED DESCRIPTION WITH REFERENCE TO THE DRAWINGS

15 In the embodiment of the invention illustrated in the drawings a drill rig generally indicated by numeral (1) comprises an upper frame (2) and a lower frame (3). The lower frame (3) has a single roughly centrally disposed spaced pair of rail wheels (4) whereby it can be moved around and each end of the lower frame has screw threaded jacking arrangements (5) and (6) at the rear and front thereof respectively. The upper frame (2) supports above it a drill boom (7) carrying a carriage (8) with a drill (9) thereon slung underneath the boom (7). The boom is 20 actually supported on a transverse track (10) (see Figure 2) carried by the upper frame (2) in a manner which will be described hereinafter.

25 The upper frame (2) and lower frame (3) are interconnected by two elongate supports (11) and (12) pivotally connected together by means of a pivot (13) intermediate their ends. The one elongate support has its lower end (14) attached to the lower one end of the rear of the lower frame by a pivot (15) and its upper end (16) is pivotally connected to a slide (not shown) confined to

longitudinal movement along a lipped groove (17) extending along the forward portion of the upper frame (2).

5 The upper end (18) of the other elongate support is pivotally attached to the rear end of the upper frame by a pivot (19) and its lower end (20) is similarly slidable along an inwardly lipped guide (21) which forms the forward portion of the lower frame and in fact carries at its forward end the forward screw threaded jack (6). The lower end (20) of the latter elongate support (11) has a formation adapted to co-operate with notches (22) spaced apart along the length of a gauge member (23) extending parallel to the guide (21). The gauge member has notches on two 10 opposite edges and is rotatable about its own axis to direct one edge or the other upwardly. Also it can be rotated to an intermediate position in which no notches are directed upwardly for co-operation with the lower end of the support (11) in which case the drill rig can be totally collapsed to bring the upper and lower frame substantially together for transport or storage purposes.

15 The positioning of the pivot along the lengths of the two supports (11) and (12), and the respective lengths from the pivot to their extremities, is arranged such that when the drill rod (24) itself is located centrally and on the grade of the tunnel being developed the central region holes can be drilled in the exact direction of the tunnel. As the upper frame is raised or lowered the drill rod will 20 become increasingly more inclined towards the hanging or foot wall, as the case may be, until at the extremities the drill rod is directed at the exact desired inclination for the upper-most and lower-most holes respectively. The former position is illustrated in Figure 1.

25 The notches in the gauge member (23) are arranged such that they determine fixed elevations of the upper frame relative to the lower frame which correspond to the desired positions of holes to be drilled in a standard pattern for the tunnel development. Accordingly once the rig has been set up no measuring or marking of a development face is necessary only adjustment of the height according to the notches in the gauge member (23).

30 Regarding the lateral positioning of the drill and drill boom the transverse, roughly horizontal track (10) follows a substantially straight path across the central region (25) of the upper frame and has a rearwardly deflected end region (26) on each side. The central region enables holes to be drilled in the face in vertical planes parallel to the development grade. However the end regions (26) cause the drill

rod (24) to be directed laterally outwardly at an inclination to the side walls of the tunnel for the same purpose of breaking out rock in a manner resulting in a straight rock wall being developed. In this case fixed lateral positions of holes to be drilled are determined by a series of spaced holes (27) in the track which are to be aligned with a hole associated with the boom, and a pin can be placed through the aligned holes to lock the boom in position for drilling a particular hole. This determines all the lateral positions at which holes are to be drilled in the predetermined pattern and, once more, no measuring is necessary on site. In order to stabilise the boom its rear end is provided with a slotted slider member (28) movable along a transverse rail (29) of the rear of the upper frame assembly.

In order to employ the drill rig of this invention the rig can be wheeled along a rail even of a temporary and undulating nature as is often the case in development regions of tunnels and because it only has two wheels it can be swivelled sideways to greatly facilitate its setting up. It is then raised and supported on its screw threaded jacks in the correct orientation so that in the central position the drill rod will extend along the grade in the centre of the tunnel. The rig can then be locked in position by means of laterally extending outrigger jacks (not shown) and an entire set of holes can be drilled simply by moving the drill boom laterally along the track, stopping it at each hole in the track and then moving the upper frame up and down through the various vertical positions determined by the notches in the gauge member (23).

Movement of the boom along the track is achieved by means of a pinion gear (31) engaging a rack (32) extending along the length of the track. Rotation of the pinion gear is effected by a crank (33) operable at the rear of the rig.

It will be understood that numerous variations may be made to the embodiment of the invention described above without departing from the scope of this invention.

For the purposes of this specification it will be clearly understood that the word "comprising" means "including but not limited to", and that the word "comprises" has a corresponding meaning.

THE CLAIMS DEFINING THE INVENTION ARE AS FOLLOWS:

1. A drill rig comprising an upper and a lower frame assembly wherein the lower frame assembly is adapted to support the drill rig during use as well as during transport and the upper frame assembly supports a drill boom and associated drill and carriage assembly, the drill rig being characterised in that the lower frame assembly and upper frame assembly are interconnected by elongate supports pivotally interconnected intermediate their ends to divide each support into a foremost limb and a rear-most limb wherein at least the operatively upper and rear-most support limb is shorter than the operatively upper and foremost support limb, the arrangement being adapted to automatically adjust the inclination of the drill boom to the grade as the upper frame assembly is raised and lowered relative to the lower frame assembly.
2. A drill rig as claimed in claim 1 in which the forward ends of each of the elongate supports are movable along part of the length of the upper and lower frames respectively.
3. A drill rig as claimed in claim 2 in which the lower frame has a series of stop positions co-operating with the associated end of the co-operant support, the stop positions corresponding to desired heights of holes to be drilled by the drill rig.
4. A drill rig as claimed in claim 1 in which a single hydraulic piston and cylinder assembly is coupled between the lower frame assembly and the lower end region of the lower rear-most limb of the supports.
5. A drill rig as claimed in claim 1 in which the lower frame assembly has a simple pair of supporting rail wheels positioned intermediate its ends.
6. A drill rig as claimed in claim 1 in which the forward and rearward ends of the lower frame assembly have adjustable jacks for supporting the lower frame on a foot wall in adjustable manner.

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7. A drill rig as claimed in claim 1 in which at least the upper frame assembly has laterally extendible outrigger arms for locking against the side walls of a tunnel during drilling operations.
 8. A drill rig as claimed in claim 1 in which the upper frame assembly includes a transversely extending track made to a required profile and substantially supporting the drill boom assembly with a rearward guide co-operating with a guide formation on the rear end of the drill boom assembly whereby the drill boom assembly can be moved laterally with a drill parallel to the grade in the central region and at or towards the extremities with the drill being inclined somewhat outwardly from the grade in plan view.
 9. A drill rig as claimed in claim 8 in which the track includes a rack co-operating with a pinion associated with the drill boom and wherein rotation of the pinion is adapted to move the drill boom laterally along the length of the track.
 10. A drill rig as claimed in claim 9 in which the pinion is rotatable by means of a crank.
 11. A drill rig assembly as claimed in claims 8 in which the track has a series of formations extending along its length and the boom has one or more formations for registration therewith in a series of positions corresponding to positions of holes to be drilled.

Dated this 22nd day of June 1999

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2) NORTHAM PLATINUM LIMITED

By their Patent Attorneys

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